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Aluminum Production, Raw Materials, and Trade, USSR, 1956

I. Introduction

Only limited information on the status of the aluminum industry of the USSR is available for analysis in the Free World. Until the announcement of the Sixth Five Year Plan and subsequent publicity regarding the planned aluminum developments in both Siberia and Kazakhstan, little positive data had been released. This situation results primarily from a Soviet decree of June 1947 which prohibits the disclosure of information about all aspects of this metal, and all other nonferrous metals and minerals. It appears, in fact, that the standard for applying the 1947 decree may depend not only on the strategic significance of a given commodity, but also on the success with which planned goals are met. Other commodities, equally protected from disclosure by the 1947 decree, have been more highly publicized. In most instances, however, the publicity was centered around achievement or overfulfillment of plan goals.

In the absence of reliable data, the analysis of such fragmentary information as is available can easily lead to erroneous conclusions. Heretofore, the intelligence community has generally assumed that the level of aluminum production provided for in the Fourth Five Year Plan was achieved by 1950. Re-examination of the bits and pieces of information on Soviet aluminum production over the 1946-1950 period indicates that this assumption was incorrect and resulted in a highly inflated figure for that year. Since production estimates for all subsequent years relate back to 1950, the magnitude of the error increases each year beyond 1950.

Estimating Soviet aluminum production has been made more difficult by conflicting data regarding whether 1945 or 1940 production was used in determining

Approved For Release 1999/09/02 : CIA-RDP79-01203A000200330002-6

Approved For Release 1999/09/02 : CIA-RDP79-01203A000200330002-6

the 1950 Plan goal. The involved nature of this problem precludes its discussion in this memorandum; but in deriving the estimates contained in this memorandum, it has been assumed that the 1950 Plan goal was double the 1945 output.

II. Production Estimates

The production of primary aluminum in the Soviet Union is estimated as follows (in thousands of metric tons):*

1937	37.7	1951	165.0
1938	43.8	1952	200.0
1939	49.0	1953	241.4
1940	59.9	1954	327.1
1941	34.5	1955 (Plan)	354.4-359.2
1942	51.9	1955 (Achievement)	381.6
1943	62.3	1956	412.2
1944	74.0	1957	513.5
1945	86.3	1958	595.7
1946	94.5	1959	691.0
1947	103.5	1960 (Plan)	801.4
1948	113.3		
1949	124.1		
1950 (Plan)	172.6		
1950 (Achievement)	136.3		

III. Aluminous ores in the USSR**

1. Bauxite

Until the 1950's, when the processing of nonbauxite ore was evidently perfected, bauxite provided the raw material for the Soviet aluminum industry. Deposits in the Tikhvin area (East of Leningrad) and in the Urals have supplied

* Sources for these figures are given in Appendix A, attached.
** Additional information about the aluminous ore situation in the USSR may be obtained in an Air Force report which discusses this subject extensively. 1/

Approved For Release 1999/09/02 : CIA-RDP79-01203A000200330002-6

Approved For Release 1999/09/02 : CIA-RDP79-01203A000200330002-6

the bulk of this material. The Tikhvin bauxites are estimated to have an aluminum oxide (Al_2O_3) content of about 48%, but they are high (13.2%) in SiO_2 and difficult to process. These deposits may now be close to depletion. The bauxites of the Urals region are of higher grade than those of Tikhvin, averaging about 50-55% Al_2O_3 with only 5-10% SiO_2. Although the Urals region is still a major producing center, there is no doubt that lower-grade bauxites are being utilized in alumina production. Problems of excessive ground water and deep mining tend to complicate mining operations in the Urals, and to increase costs.

The Soviet aluminum industry will probably continue to be based primarily on bauxite ores throughout the Sixth Five Year Plan. Of the four new aluminum reduction plants called for during the Sixth Five Year Plan, three will use bauxite ores. 2/ More careful prospecting and/or technological improvements in the methods of processing bauxite have led to Soviet statements that the newly exploited (but not newly discovered) deposits of bauxite near Turgai in Kazakhstan, Salair in West Siberia, and in Buryat-Mongol ASSR will be used to supply the new aluminum facilities. With the exception of occasional comments about new deposits in the Southern Urals, most of the recent Soviet publicity about bauxite has been limited to discussion of the deposits in Kazakhstan and Siberia.

2. Nonbauxite ores

Soviet technicians are among the world's leaders in experimenting with the utilization of alunite and nepheline, the two most important nonbauxite aluminous ores in the USSR. Prewar estimates indicated nepheline reserves of 11 billion tons, including one billion tons in occurrence with apatite deposits. The Al_2O_3 content of the nephelines is rather low (30%) and the SiO_2 content high (43%).

Approved For Release 1999/09/02 : CIA-RDP79-01203A000200330002-6

Approved For Release 199[redacted]RDP79-01203A000200330002-6

Alunite reserves of the Transcaucasus alone were reported at 100 million tons. Alunite has an Al_2O_3 content of about 20% and an SiO_2 content of 40% or higher. At least two new nonbauxite alumina facilities, a nepheline plant at Achinsk in East Siberia and an alunite plant at Kirovabad in the Transcaucasus, are scheduled to begin operations before 1960. 3/ 4/ The Kirovabad alumina plant is scheduled to supply at least two aluminum reduction plants in the Transcaucasus area (Yerevan and Sumgait) which are now based on alumina derived from bauxite. In addition, it is reported that by the end of 1960 Kirovabad will also be capable of supplying alumina for the new Stalingrad aluminum plant which is scheduled to begin operations before the end of 1957. 5/ 6/ The Achinsk facility will provide alumina for operating the Krasnoyarsk aluminum plant, possibly intended to be the USSR's largest reduction works. 7/

In addition to the two new alumina plants there is at least one aluminum combine already reported to be operating on nonbauxite ore, and there are three or four additional facilities located in areas where the use of nonbauxite ores would seem to be feasible. The USSR's oldest alumina-aluminum plant, Volkhov, is reported to be using nepheline tailings, resulting from the processing of apatites for use in mineral fertilizer, from the Kola peninsula. 8/ Moreover, it is possible that the Boksitogorsk and Pikalevo (if this is, in fact, operating) alumina plants are using nephelines rather than bauxite. Neither is much more than 70 miles by rail from Volkhov. Equally logical would be the assumption that the aluminum reduction works at both Nadvoitsy in the Karelo-Finnish SSR and Kandalaksha on the Kola peninsula are using--if not producing--alumina derived from the relatively nearby nephelines. (The Kandalaksha plant may be no more than

Approved For Release 199[redacted]A-RDP79-01203A000200330002-6

Approved For Release 1999/09/02 : CIA-RDP79-01203A000200330002-6

an experimental operation, however.)

3. Costs of bauxite vs nonbauxite ores

The difficulty of determining the relative economy of using bauxite or nonbauxite ores in the production of alumina precludes any but the most cursory discussion at this time. Two of the most important cost items in alumina production are transportation and fuel supplies. There is some evidence to indicate that the Soviets may have succeeded in reducing the cost of alumina produced from nepheline below the cost of that produced from low-grade bauxite. Certainly this would appear to be the case in view of the reports that the Volkhov aluminum plant is processing Kola nephelines instead of Tikhvin bauxites. The bauxite deposits lie within 100 miles of the Volkhov aluminum combine, but the nepheline tailings recovered from the Kirovsk Apatite Plant on the Kola peninsula must be transported more than 500 miles. It should also be emphasized that the costs of processing the nonbauxite ores are in effect reduced by recoveries of such valuable byproducts as sulfur trioxide, cement, soda, and potash.

IV. Sino-Soviet Bloc trade in aluminum and aluminous raw materials

Only fragmentary information is available on Sino-Soviet Bloc trade in aluminum and aluminous ores. Consequently, the following comments are of a general nature.

A. Aluminum metal

Although the data are relatively limited, it seems reasonably certain that the Sino-Soviet Bloc aluminum industry is generally independent of the Free World supplies of aluminum metal. The Bloc did not take full advantage of the COCOM quota of 11,000 tons of aluminum metal and alloys in either 1955 or 1956.

Approved For Release 1999/09/02 : CIA-RDP79-01203A000200330002-6

Approved For Release 1999/09/[redacted]-RDP79-01203A000200330002-6

In fact, there is sufficient evidence to indicate that the Bloc is a net exporter of aluminum metal. The USSR, the principal Bloc country dealing in aluminum with the Free World, had concluded trade agreements calling for the delivery of about 25,000 tons of aluminum to Free World countries in 1956, while they imported only about 2,000 tons from the Free World.

Aluminum trade within the Bloc in 1956 consisted mainly of USSR imports of about 25,000 tons of primary aluminum from Hungary.* These imports represented less than 6 percent of the USSR's supply of aluminum in that year.

B. Bauxite

Although the Bloc is self-sufficient in aluminum metal, it is dependent on Free World sources for bauxite. Most of the Bloc's imports have gone to the USSR. In 1956, the aluminum equivalent of bauxite imported by the USSR was about 40% of the country's primary aluminum production. (See Appendix B for details.) It is possible, of course, that some of the imported bauxite was diverted to purposes other than primary aluminum production, but such uses would take a relatively minor portion of the total bauxite import. In the US, for example, about 90% of the annual bauxite supply, including imports, is consumed in aluminum production.

In 1956, the USSR imported almost 400,000 tons of bauxite from Hungary and about 325,000 tons from Greece. The disruption of the Hungarian aluminum industry during the last quarter of 1956 may have contributed directly to the Soviet's failure to achieve the planned average annual increase of about 16% called for by the Sixth Five Year Plan. The reported increase in the USSR's

* It was recently reported that in 1957 the USSR's nonferrous exports to Hungary will include 8,000 tons of aluminum bars. 9/ There is, unfortunately, no indication of whether this will represent a net export by the USSR.

Approved For Release 1999/09/[redacted] CIA-RDP79-01203A000200330002-6

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aluminum production in 1956 was only 8% over 1955.

There is some reason to believe that the Soviets may have increased their purchases from Greece in an attempt to take up the slack caused by the Hungarian difficulties, but this reason can hardly account for the bulk of Greek exports to the Soviet Union, which have been increasing rapidly ever since 1954. For example, in 1954 Greece exported only 12,000 tons of bauxite to the USSR. The 1957 agreement calls for delivery of 400,000 tons of bauxite from Greece. 10/

Although there is no doubt that the Soviets hope to achieve independence from foreign supplies of aluminous raw materials, the program to produce alumina from low-grade bauxite and nonbauxite ores cannot yet be considered a complete success. In any event, neither Kirovabad nor Achinsk, the major producing facilities for nonbauxite ores in the USSR, is scheduled to begin operations until late in the Sixth Five Year Plan. It is believed that the raw materials currently available to existing mines--and possibly even the capacity of processing facilities--is inadequate to take up the slack which would be created by the loss of foreign supplies. Soviet aluminous ore supplies, in fact, would probably be insufficient to compensate even for the loss of Hungary's exports of bauxite, except as a long term proposition.

As already indicated, Soviet imports of bauxite from the most likely foreign supplier, Greece, have been increasing steadily since 1954. Yugoslavia is a potential supplier of the USSR, but as of February 1957 had made no known deliveries on the 1956 agreement calling for the export of 100,000 tons of bauxite to the USSR. 11/ Other supplies might be obtained from Indonesia, or from Western producers.

The full significance of foreign bauxite exports to the USSR aluminum supply

Approved For Release 1999/09/[redacted] CIA-RDP79-01203A000200330002-6

Approved For Release 1999/09/02 : CIA-RDP79-01203A000200330002-6

situation is further complicated by the estimate that during 1955 and 1956, and possibly even earlier, the USSR produced more aluminum than required for domestic consumption. Data on both actual aluminum exports and proposals for export during these years indicate an exportable surplus. In addition, although attempts to estimate the Soviet demand for aluminum (assuming minimum production and maximum consumption) admittedly have been unsatisfactory, they generally support the conclusion that supply exceeds demand. The unexported surplus must have been added to the aluminum stockpile, the magnitude of which is unknown.

V. Conclusions

Although the preceding comments indicate the broad gaps in the intelligence data on the Soviet aluminum industry, there are at least two tentative conclusions worth noting:

A. The present figures on aluminum production for the 1946-56 period represent a substantial downward revision of previous estimates. It is believed that these figures are more realistic than those heretofore in common use in the intelligence community. These revisions are based on a re-examination of the Fourth Five Year Plan in its entirety, including detailed study of the individual aluminum plants scheduled for construction and/or reconstruction during this period. There is little question, in view of this re-examination, that the Soviets failed to meet the 1950 aluminum production mainly because they underfulfilled their construction program for the aluminum industry.

B. The Soviets are not yet independent of foreign supplies of bauxite; but if their program for alumina production from low-grade bauxites and nonbauxite ores is successful, about the only explanation for continuing foreign imports would be

Approved For Release 1999/09/02 : CIA-RDP79-01203A000200330002-6

Approved For Release 1999/09/02 : CIA-RDP79-01203A000200330002-6

political (or strategic) considerations. These, of course, are beyond the purview of this paper.

Approved For Release 1999/09/02 : CIA-RDP79-01203A000200330002-6

Approved For Release 1999/09/02 : CIA-RDP79-01203A000200330002-6

Appendix A

1937: Itogi vypolneniya vtorogo pyatiletnego plana...., 1933-1937 (Moscow, 1939), p. 24.

1938: Sotsialisticheskoe stroitel'stvo soyuza SSSR 1933-1938 (Moscow, 1939), p. 62 as cited in Gregory C. Zec Aluminum Industry of the USSR and Satellite Nations (Washington: CEIR, Inc., 1955), p. 25.

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1940: Voznesenskiy, N. A., Economic Results of the USSR in 1940 and the Plan of National Economic Development for 1941 (Moscow: Foreign Languages Publishing House, 1941), p. 37, states that: "As compared with 1937, output of aluminum in 1940 increased by 59%."

1941 and 1945: Stepanov, P. N. Geografiya Promyshelennosti SSSR (Moscow, 1950), p. 115 states that production in 1945 was almost 2.5 times the 1941 output. Since Izvestiya 2 Apr 46 stated that 1945 output was 144% by comparison to 1940 production, the 1941 estimate was derived from the 1945 figure of 86,300 m. t.

1942 and 1943: Voznesenskiy, N. A., The Economy of the USSR during World War II (Washington: Public Affairs Press, 1948), p. 77 (some editions of same date p. 84) states that between 1942 and 1943 output of aluminum increased by 20%. Since Sovetskoe Godsudarstvo v Otechestvennoi Voine, 15 Dec 1944, gives 1943 output as 104% of 1940 production, the estimate for 1942 was derived from the 1943 base of 62,300 m. t.

1944: Interpolated.

1946 through 1949: Interpolated.

1950 (Plan): Zakon o pyatiletnem plane vosstanovleniya i razvitiya narodnogo khozyaystva SSR na 1946-1950 gg (Law on the Fourth Five Year Plan for the Restoration and Development of the National Economy of the USSR, 1946-1950) (OGIZ, 1946), p. 15 and The Great Stalin Five Year Plan for the Restoration and Development of the National Economy of the USSR for 1946-1950 (Washington, Embassy of the USSR, June, 1946), p. 5 both imply that the 1950 aluminum goal is twice that of 1945 production. P. F. Lomako positively stated that this was the case in Tsvetyye Metally, No. 5 (Sept-Oct), 1947, p. 6.

1950: (Achievement): Estimated.

1951-1953: Interpolated.

1954: Izvestiya, 8 Feb 55, states that during the first four years of the Fifth Five Year Plan output increased 140%.

1955 (Plan): Directives of the 19th Party Congress for the Fifth Five Year Plan of the Development of the USSR in 1951-1955 (Moscow: Foreign Languages Publishing House, 1952), p. 8, stated that aluminum output should be increased by not less than 160% over that of the Fourth Five Year Plan. Estimated on this basis, the Plan called for 354,400 tons. However, Izvestiya, 8 Feb 55, carried a speech by P. F. Lomako, Minister of Nonferrous Metallurgy, in which it was specified that production in 1955 would be increased 9.8% over the 1954 output, or to an estimated 359,200 tons.

1955 (Achievement): Pravda, 26 Feb 56, carried a speech by P. F. Lomako in which it was stated that 1955 output was 2.8 times that of 1950.

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Approved For Release 1999/09/02 : CIA-RDP79-01203A000200330002-6

Approved For Release 1999/09/02 : CIA-RDP79-01203A000200330002-6

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Appendix B

USSR Bauxite and Aluminum Imports, 1956

Thousand Metric Tons

Origin	Bauxite			Aluminum		Total Bauxite and Aluminum
		Aluminum Equivalent 1/				
	Quantity	Quantity	% of USSR Aluminum Production 2/	Quantity	% of USSR Aluminum Supply 3/	Aluminum Equivalent 1/
Other Bloc						
Hungary 4/	395.0	79.0	19.2	25.0	5.7	104.0
Free World						
Greece	323.5 5/	64.7	15.7	—	—	64.7
Norway 6/	—	—	—	2.0	0.5	2.0
Total	718.5	143.7	34.9	27.0	6.2	170.7

1. Estimated on basis of 5 tons of bauxite required for 1 ton of aluminum.
2. USSR aluminum production in 1956 is estimated to be 412,200 metric tons.
3. USSR aluminum supply in 1956 is estimated to be 439,200 metric tons.
4. M/NF estimate of deliveries for first nine and one-half months of 1956, that is, up to the time of the internal uprising in Hungary.
5. Figure for first six months derived from US Dept. of Commerce, Bur. For. and Dom. Comm., Country by Commodity Series, Jan-June 1956. U; Jul-Oct figure supplied at M/NF request (1 Mar 57) by Bur. For. and Dom. Comm. from official Greek reports; and Nov-Dec figure estimated by M/NF.
6. Amount specified in trade agreement cited in State, Oslo, Despatch No. 752, 20 June 56. C. Assume delivery completed.

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2/ Current Digest of the Soviet Press, VIII, No. 5, 14 Mar 56, p. 19-20. U. Eval. RR 2.

OIAb3b1 3/ Treasure Island Serial No. 171579, citing Izvestiya, 24 Nov 56. U. Eval. RR 2.

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6/ Sovetskaya Rossiya, Moscow, 21 Sep 56. U. Eval. RR 2, in CIA FDD Summary No. 1193, 16 Jan 57, Data on USSR Extractive Industries (No. 18), p. 54. Eval. RR 2.

7/ Current Digest of the Soviet Press, VII, No. 47, 2 Jan 57, p. 20. U. Eval. RR 2.

8/ Pravda, 26 Feb 56, U. Eval. RR 2, in CIA FDD Summary No. 956, 7 Jun 56, Data

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10/ State, Athens, Dsp. 551, 30 Jan 57. U. Eval. RR 2.

11/ State, Belgrade, Dsp. 352, 17 Jan 56. OFF. USE. Eval. RR 2.

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